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(54) Shock absorbing assembly

(57) A shock absorbing assembly suitable for damping out vibrations in a machine or apparatus comprises resilient members (3) each comprising two opposed portions (8, 9) of four-sided frusto-pyramidal form and having a waisted portion intermediate the opposed portions (8, 9), the resilient members (3) being located between a carrier (2) fixed to a vibrating part of a machine or apparatus, and bearers (1) located on a support (11). The bearers (1) and carrier (2) comprise plates having recesses (7, 5) which receive the opposed portions (8, 9) of the resilient members (3). The carrier (2) is retained to the support (11) by fixings, such as bolts (12) passed through resilient bushes (13), which allow relative movement between the carrier (2) and the support (11).

An application of the shock absorbing assembly is in an internal combustion engine powered high pressure jetting machine where it is used to isolate the burner from the vibration of the engine.

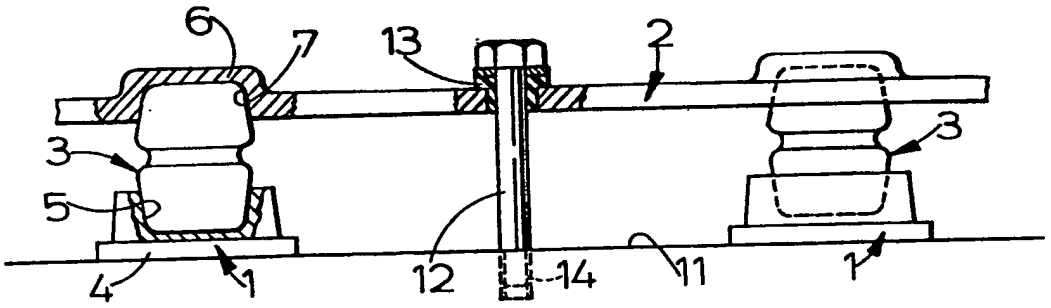

FIG. 1.

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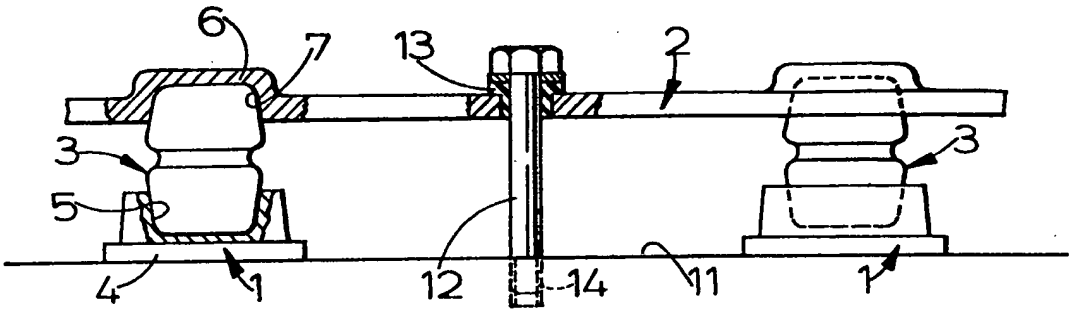


FIG. 1.

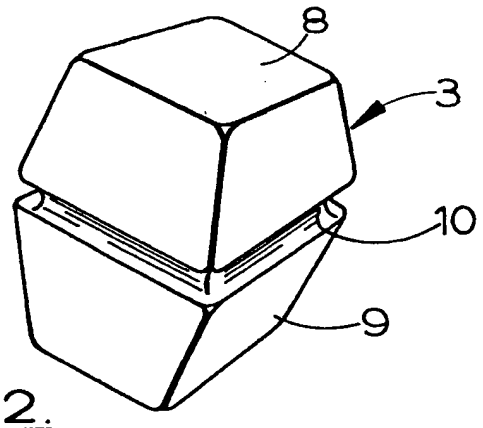
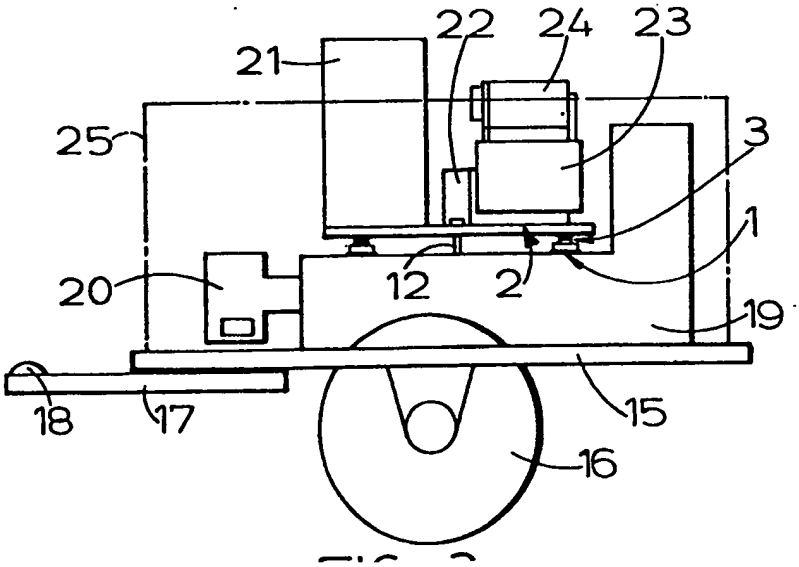


FIG.2.



SPECIFICATION

Shock absorbing assembly

This invention relates to a shock absorbing assembly for machinery or apparatus to reduce the transmission of vibrations from one part to another of the machinery or apparatus, or from the machinery or apparatus to a support therefor.

Most power driven machinery or apparatuses include shock absorbing arrangements to prevent or reduce damage being caused by stresses to the prime mover or other vibrating part of the machinery or apparatus and to the support on which the prime mover part is mounted, and other equipment which may be mounted on the support.

A form of shock absorber often used in connection with internal combustion engines, for example, is of a composite construction comprising a body of a resilient material, usually rubber or synthetic rubber, to which are bonded bolt-carrying plates or other members, the bolts being fitted, or engaging, with nuts for securing the shock absorber in position for use between the engine, or a part carrying the engine, and the body or other support on which the engine is mounted for use. There can be problems in assembling the shock absorber for use because holes in the parts between which the shock absorber is to be secured have to be correctly positioned to be engaged by the bolts. Disassembly can also give rise to difficulties, and there is the possibility that under the vibrations to which the shock absorber is subjected in use the bonds between the resilient body and the bolt-carrying plates or other members will break down and cause the shock absorber to fail.

The present invention seeks to avoid such problems.

According to the present invention a shock absorbing assembly is provided which comprises a bearer located, or adapted to be located, on a support, a carrier fixed to, or adapted to be fixed to, the prime mover or vibrating part of a power driven machine or apparatus, and a shock absorber in the form of a body of resilient material located between the bearer and carrier, the resilient body having opposed portions which engage in sockets at the bearer and carrier and thereby position and retain the resilient body between the bearer and carrier.

The engagement of the opposed portions in the sockets at the bearer and carrier may be all that is required to locate the resilient body. Thus, the use of bolts, bonding agents or other fixing means may be obviated so that installation of the shock absorber for use, and its removal, is facilitated.

Hollows or recesses may be formed in the bearer and carrier to provide the sockets. The bearer and carrier may be castings in which case the hollows or recesses may be formed integrally with the castings. Alternatively, the hollows or recesses may be machined out of the bearer and carrier or provided in members secured to the bearer and carrier.

It is preferred that the sockets are formed by hollows and recesses which do not open through the bearer and carrier. This is because ready access for oil and other matter to the resilient body which might be harmful to the body is then avoided. In some installations it may only be desirable for the hollow or recess at the carrier not to open through that part to prevent such matter reaching the resilient body.

The resilient body may be in the general form of a block. The opposed portions of the body may be of circular cross-section but preferably they are of non-circular cross-section. The sockets at the bearer and carrier are preferably of complementary cross-section to facilitate the location of the resilient body. The opposed portions may taper towards their extremities, again as an aid to engaging the portions with the sockets. In one embodiment the opposed portions are of frusto-pyramidal, preferably four-sided, shape. There may be a waisted portion intermediate the opposed portions which assist in enhancing the resilience of the body.

Conveniently the resilient body is made as a moulding. It may be made of rubber, synthetic rubber or any other suitable material having the desired vibration damping characteristics. When the shock absorbing assembly is to be used in oily conditions, as well as having the sockets not opening at least through the carrier, it is desirable to have the resilient body made of a suitable oil resistant material.

As the resilient body may be made as a moulding in one-piece it may be manufactured more easily and cheaply than the known shock absorber mentioned having the bolt-carrying plates or other members bonded to the body.

The bearer may be in the general form of a cup which simply rests on the support (which in some installations may be the floor or ground) or which may be positively fixed in any convenient manner to the support. For example, it may be bolted or welded to the support.

The carrier may be of any convenient form suitable for carrying the prime mover or vibrating part. Generally it may be of plate or substantially plate form.

The resilient body may be assembled with the bearer and carrier merely by placing the body on the bearer with one of its opposed portions engaged in the socket at the bearer, and then resting the carrier on the resilient body such that the socket of the carrier is engaged by the other one of the opposed portions of the resilient body.

Two or more of the bodies may be similarly located between the carrier and the bearer, or a plurality of the bearers.

In some installations it may be desirable for a fixing to be provided between the carrier and the support, for example by means of one or more bolts and nuts. Where a fixing is provided it is essential for it to allow relative movement between the carrier and bearer to allow for the vibration of the carrier. For example, a bolt, or each bolt, used for the fixing may be passed through a resilient bush in the hole in the carrier

through which the or each bolt extends. In other installations the weight of the prime mover or vibrating part which the carrier supports in use, and any other part or parts on the carrier, may be sufficient to retain the carrier in position relative to the support on the resilient body or bodies.

One application in which the shock absorbing assembly now provided has proved to be very satisfactory, and where the known shock absorber mentioned above has not been able to cope adequately, is in supporting the engine of an internal combustion powered, high pressure jetting machine such as used for cleaning, particularly industrial cleaning, purposes. In one form of the machine in which the engine and pumping gear are mounted on a wheeled chassis suitable for towing and the shock absorbing assembly has been provided to support the engine the vibration transmitted from the engine to the chassis has been almost negligible, and the assembly has been effective for considerably longer than the known shock absorbers had been in such a machine. The assembly may be used effectively with either a petrol or a diesel driven engine.

An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which,

Figure 1 is a diagrammatic side view, partly in section, of a shock absorbing assembly in accordance with the present invention,

Figure 2 is a perspective view of a shock absorber of the assembly, and

Figure 3 shows diagrammatically the shock absorbing assembly installed in a diesel powered, high pressure jetting machine.

Referring to Figure 1, the shock absorbing assembly comprises a pluralityof bearers 1, a carrier 2 and a plurality of shock absorbers in the form of resilient bodies 3.

Each bearer 1 is a casting in the form of a square-shaped cup having a flat base 4 and its interior constituting a closed-bottomed socket 5 of square cross-section which tapers downwards from its mouth at the top of the cup.

The carrier 2 is also a casting of generally rectangular plate form having hollowed portions 6 opening to the underside of the plate. These hollowed portions 6 also provide sockets 7 which are of similar square cross-section to the sockets 5 of the bearers and taper upwardly from their mouths at the underside of the plate.

Each of the resilient bodies 3 is formed as a one-piece moulding from rubber or synthetic rubber. The material used depends upon the load-bearing and resilience characteristics required and whether the resilient bodies are to be used in oily, dry or wet conditions. Some materials which have been used are ebonite, neoprene compositions, nitrile and silicone rubbers, and natural and synthetic rubber blends, for example natural rubber and a styrene butadiene rubber compound. Other materials may be used. As shown in Figure 2, each resilient body 3 comprises two opposed portions 8, 9 of four-sided, frusto-pyramidal shape joined at their bases by a short integral, square-section waist portion 10 of smaller side dimensions that the bases of the opposed portions 8, 9. The opposed portions 8, 9 are complementary in shape to the sockets 5 and 7 of the bearers and carrier respectively.

For use the bearers are positioned on a required support 11 and may be secured to the support; the resilient bodies 3 are placed in the bearers, one of the opposed portions 8 of each resilient body engaging snugly in the socket 5 of the respective bearer and the other of the opposed portions 9 projecting upwards from the bearer, and then the carrier is rested on the resilient bodies, the upper portions 9 of the latter engaging snugly in the sockets 7 of the carrier. Thus, once the bearers have been positioned to correspond to the positions of the sockets 7 of the carrier the putting together of the other components of the shock absorber assembly is easily carried out. Similarly, disconnecting of the components of the assembly is readily effected.

In the assembly as shown in Figure 1 there are fixings between the carrier and the support 11 provided by bolts 12, only one of which is shown, which are passed down through holes in the carrier fitted with rubber or synthetic rubber bushes 13 and tightened into internal threadings 14 at the support. The bushes 13 allow the carrier to move relative to bolts 12 under vibration. The bolts are passed through the carrier at positions well spaced from the resilient bodies so that in oily installations, for example, oil which may seep through the holes and which might be harmful to the resilient bodies is unlikely to reach the resilient bodies. The hollowed portions 6 of the carrier at which the sockets 7 are provided are imperforate at the top of the carrier so that oil cannot reach the resilient bodies at those portions. As the sockets 5 of the bearers are closed at their bottoms any oil which may seep through the bolt holes in the carrier and on to the support 11 cannot reach the resilient bodies at the bearers either.

Reference will not be had to Figure 3 in which the shock absorbing assembly as described above is installed in a diesel powered, high pressure jetting machine. The machine supplies hot water under pressure. The machine has a chassis 15 mounted on road wheels 16 and includes a tow bar 17 and coupling 18 to enable the machine to be hitched to a vehicle for towing. On the chassis 15 a heat exchanger 19 is fixed which is heated by an oil-fired burner 20 fixed in turn to the heat exchanger and which heats water in the heat exchanger and is electrically ignited and controlled. The bearers 1 of the shock absorbing assembly are secured at the appropriate positions on a flat top surface of the heat exchanger housing. The carrier 2 has mounted on it a diesel engine 21, a feed water pump 22, a high pressure water which heats water in the heat exchanger and is electrically ignited and controlled. The bearers 1 of the shock absorbing assembly are secured at the appropriate positions on a flat top surface of the heat exchanger housing. The carrier

2 has mounted on it a diesel engine 21, a feed water pump 22, a high pressure water pump 23, which is belt driven by the diesel engine, an alternator 24 which is also driven by the engine and provides the electrical power of the machine, and other control gear and pipework of the engine and pumps. In this installation there are four resilient bodies 3 and associated bearers positioned near each of the four corners of the carrier, and the carrier is secured to the heat exchanger by four of the bolts 12 positioned near the mid-points of each of the four sides of the carrier and screwed into internal threadings in the heat exchanger housing.

The shock absorber assembly effectively isolates the heat exchanger from the vibrations created by the diesel engine and pumps. Hence the oil burner is shielded from those vibrations which is essential for the satisfactory and safe operation of the burner.

Opposite sides of the heat exchanger are guarded by side panels 25 which are also fixed to the heat exchanger and thus isolated from the vibrations. The controls, not shown, for the oil burner and pumps are provided on one of the side panels.

It will be appreciated that the shock absorber assembly may be used in or with various other machines and apparatuses, apart from jetting machines, where vibrations are required to be isolated.

Where in any installations the shock absorbing characteristics of the assembly are required to be altered, it will be understood that the resilient bodies can be readily replaced by others of different resilience, harder or softer, as required. Also the carrier may be provided with sockets which will enable it to locate different numbers of resilient bodies according to the requirements of various installations.

CLAIMS

1. A shock absorbing assembly comprising a bearer located, or adapted to be located, on a support, a carrier fixed to, or adapted to be fixed to, the prime mover or vibrating part of a power driven machine or apparatus, and a shock absorber in the form of a body of resilient material located between the bearer and the carrier, the resilient body having opposed portions which engage in sockets at the bearer and the carrier and thereby position and retain the resilient body between the bearer and the carrier.

2. A shock absorbing assembly according to Claim 1 wherein the sockets comprise hollows or recesses formed in the bearer and the carrier.

3. A shock absorbing assembly according to Claim 1 wherein the sockets comprise hollows or recesses provided in members secured to the bearer and the carrier.

4. A shock absorbing assembly according to any preceding claim wherein at least the socket at the carrier does not open right through the carrier.

5. A shock absorbing assembly according to any preceding claim wherein the resilient body is in the general form of a block.

6. A shock absorbing assembly according to any preceding claim wherein the opposed portions of the resilient body are of circular cross-section and the sockets at the bearer and the carrier are of complementary cross-section to the opposed portions.

7. A shock absorbing assembly according to any of Claims 1 to 5 wherein the opposed portions of the resilient body are of non-circular cross section and the sockets at the bearer and the carrier are of complementary cross section to the opposed portions.

8. A shock absorbing assembly according to any preceding claim wherein the opposed portions taper towards their extremities.

9. A shock absorbing assembly according to Claims 7 and 8 wherein the opposed portions are of four-sided frusto-pyramidal shape.

10. A shock absorbing assembly according to any preceding claim wherein there is a waisted portion intermediate the opposed portion which assists in enhancing the resilience of the body.

11. A shock absorbing assembly according to any preceding claim wherein the resilient body is made as a moulding.

12. A shock absorbing assembly according to any preceding claim whereln the resilient body is made of an oil resistant material.

13. A shock absorbing assembly according to any preceding claim wherein the bearer is in the form of a cup which is located, or adapted to be located, on the support.

14. A shock absorbing assembly according to any preceding claim wherein the carrier is generally of plate form.

15. A shock absorbing assembly according to any preceding claim comprising a plurality of the resilient bodies located between, in respective sockets at, the carrier and one or more of the bearers.

16. A shock absorbing assembly according to any preceding claim wherein a fixing is provided between the carrier and the support which allows relative movement between the carrier and bearer.

17. A shock absorbing assembly according to Claim 16 wherein the fixing comprises at least one bolt which is passed through a resilient bush in a hole in the carrier and is retained to the support.

18. A machine or apparatus incorporating one or more shock absorbing assemblies according to any preceding claim.

19. An internal combustion engine powered high pressure jetting machine, including one or more shock absorbing assemblies according to any of Claims 1 to 17 constructed and arranged to act between the engine and a support for the engine in order to reduce the transmission of vibration therebetween.

20. An internal combustion engine powered high pressure jetting machine according to Claim 19 comprising a chassis mounted on road wheels, a heat exchanger fixed to the chassis, an electrically controlled and ignited oil-fired burner fixed to the heat exchanger, a plurality of bearers

of the shock absorbing assembly being secured to a top surface of the heat exchanger housing, and the carrier of the shock absorbing assembly having mounted on it the internal combustion engine, a feed water pump, a high pressure water pump driven from the engine, an alternator driven from the engine and providing the electrical power of the machine, and control gear and pipework of the engine and pumps.

21. An internal combustion engine powered high pressure jetting machine according to Claim 19 or Claim 20 wherein the engine is a diesel engine.

22. A shock absorbing assembly substantially as described with reference to Figures 1 and 2 of the accompanying drawings.

23. An internal combustion engine powered high pressure jetting machine substantially as described with reference to Figure 3 of the accompanying drawings.

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